# Metallization of cyanide-modified Pt(111) electrodes with copper - DTU Orbit (08/11/2017)

## Metallization of cyanide-modified Pt(111) electrodes with copper

The reduction of $Cu^{2+}$ ions irreversibly attached to the surface of a cyanide-modified Pt(111) electrode via non-covalent or weakly covalent interactions with the N atom of adsorbed cyanide was studied using cyclic voltammetry (CV) and in situ scanning tunneling microscopy (STM). Both CV and STM provide evidence that the reduction of irreversibly adsorbed $Cu^{2+}$ to Cu in $Cu^{2+}$-free sulfuric acid solutions does not result in the stripping of the cyanide adlayer. This strongly suggests that the reduction process results in the metallization of the cyanide adlayer on Pt(111), yielding a platinum-cyanide-copper sandwich configuration. STM also shows that the Cu deposit consists of isolated bidimensional nanoislands, which slowly grow through an Ostwald ripening mechanism if the potential is kept negative of the reduction peak. Metallization is not possible in perchloric acid solutions, which implies that the specific adsorption of sulfate on the bidimensional Cu nanoislands plays an important role in stabilizing them. This was confirmed by the observation on the nanoislands, using in situ STM, of the structure typical for adsorbed sulfate on the (111) faces of fcc.

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